



From cells to coastlines: How can we use physiology to forecast the impacts of climate change?

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Abstract:

The interdisciplinary fields of conservation physiology, macrophysiology, and mechanistic ecological forecasting have recently emerged as means of integrating detailed physiological responses to the broader questions of ecological and evolutionary responses to global climate change. Bridging the gap between large-scale records of weather and climate (as measured by remote sensing platforms, buoys and ground-based weather stations) and the physical world as experienced by organisms (niche-level measurements) requires a mechanistic understanding of how 'environmental signals' (parameters such as air, surface and water temperature, food availability, water flow) are translated into signals at the scale of the organism or cell (e.g. body temperature, food capture, hydrodynamic force, aerobic capacity). Predicting the impacts of how changing environments affect populations and ecosystems further mandates an understanding of how organisms 'filter' these signals via their physiological response (e.g. whether they respond to high or low frequencies, whether there is a time lag in response, etc.) and must be placed within the context of adult movement and the dispersal of larvae and gametes. Recent studies have shown that patterns of physiological stress in nature are far more complex in space and time than previously assumed and challenge the long-held paradigm that patterns of biogeographic distribution can be based on simple environmental gradients. An integrative, systems-based approach can provide an understanding of the roles of environmental and physiological variability in driving ecological responses and can offer considerable insight and predictive capacity to researchers, resource managers and policy makers involved in planning for the current and future effects of climate change.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change;
 surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Policymaker, Researcher



Climate Change and Human Health Literature Portal

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes

Geographic Feature:

resource focuses on specific type of geography

Ocean/Coastal

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Policy/Opinion

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content